

Brief Report: Quality of Life Is Impaired in Pediatric Burn Survivors with Posttraumatic Stress Disorder

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Objective This study assessed health-related quality of life (HRQOL) and posttraumatic stress disorder (PTSD) in pediatric burn survivors and examined associations between PTSD and HRQOL. **Methods** Forty-three burn survivors, ages 7–16 years, were interviewed at an average of 4.4 years after their accident using the Clinician-Administered PTSD Scale for Children and Adolescents and the TNO-AZL Child Quality of Life Questionnaire. **Results** Eight children (18.6%) met DSM-IV criteria for current PTSD. While most dimensions of HRQOL were within normal limits, social functioning was impaired. Severity of PTSD was significantly associated with physical, cognitive, and emotional dimensions of HRQOL. Children with PTSD reported an impaired overall HRQOL and limited physical (e.g., more bodily complaints) and emotional functioning (e.g., more feelings of sadness). **Conclusions** This study provides tentative evidence for a considerably high prevalence of PTSD in pediatric burn survivors and for a negative association between PTSD and HRQOL.

Key words child; posttraumatic stress disorder; quality of life.

A severe burn injury is one of the most traumatic injuries a child or adolescent can experience (Saxe et al., 2005). Because of major improvements in burn treatment over the last decades, most patients are now surviving. In a significant number of individuals, however, the injury results in long-term hospitalization, numerous painful procedures, stressful rehabilitation, and life-long physical deformities. With increasing survival rates the effects of treatment on long-term outcomes become especially important. These effects have been examined by assessing psychosocial adjustment and health-related quality of life (HRQOL) of burn survivors.

A review of the literature regarding outcomes of pediatric burn survivors shows contradictory findings regarding the prevalence of psychopathology (Noronha & Faust, 2007). While some studies report that children and adolescents who experienced burns adjust well (Blakeney et al., 1998; Landolt, Grubenmann, & Meuli, 2002a), other studies indicate that 20–50% of the burn survivors may experience long-term psychological

maladjustment (Meyer, Robert, Murphy, & Blakeney, 2000; Piazza-Waggoner et al., 2005; Stoddard, Norman, Murphy, & Beardslee, 1989b). These inconsistent findings may be explained by methodological issues such as selection bias, heterogeneous samples with regard to injury severity, varying follow-up intervals, and different assessment measures. Studies assessing quality of life issues found HRQOL in pediatric burn survivors to be good, with some authors reporting problems in psychosocial domains (Landolt et al., 2002a; Rosenberg et al., 2006; Sheridan et al., 2000). Regarding predictors of HRQOL and psychological adjustment previous studies found quality of family relationships, age at accident, premorbid psychopathology, and parental adjustment to be important variables (Noronha & Faust, 2007). Interestingly, most studies found no significant association between burn severity and adjustment.

A burn accident often meets Diagnostic and Statistical Manual for Mental Disorders IV (DSM-IV) criteria for the definition of a psychological trauma.

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As Gilboa, Friedman, and Tsur (1994) have noted, traumatic aspects of a burn injury include not only the actual burn accident but also the difficult period of hospitalization (pain, anxiety, and lack of control) and the subsequent renewed encounter with the social environment. Several studies have reported considerably high rates of posttraumatic stress disorder (PTSD) in adults after burns (Baur, Hardy, & Van Dorsten, 1998; Yu & Dimsdale, 1999). These studies have also shown that PTSD can result in significant psychosocial impairments, including failure of early return to work, increased economic burden, and social withdrawal.

In children, however, studies on PTSD after burn injuries are scarce. There is only one early study by Stoddard, Norman, and Murphy (1989a) in a sample of 30 children with a mean burn size of 38% that reported DSM-III rates of PTSD. In that study, 6.7% of the patients met criteria for full PTSD at an average time of 8.9 years postburn. The authors reported a tendency for larger burns, older age at burn, and low socioeconomic status to be related to the presence of the diagnosis. Recently, a US research group conducted several studies on issues of posttraumatic stress in children who experienced burns (Saxe et al., 2005, 2006; Stoddard et al., 2006a,b). Important findings included the presence of acute stress symptoms in young children and the identification of pathways of PTSD. However, to date, there is no study that has reported DSM-IV-based prevalence rates of PTSD in pediatric burn survivors. In addition, there are no data on the association of PTSD with HRQOL in children with burns. This is an important gap in the research literature, considering findings in adults that suggest an association of PTSD with lower HRQOL and poorer physical health in survivors of different types of trauma and illness (Kapfhammer, Rothenhauser, Krauseneck, Stoll, & Schelling, 2004; Margruder et al., 2004; Stein, Walker, Hazen, & Forde, 1997). Notably, two studies among adult patients with physical trauma reported that PTSD had a substantial negative impact on short- and long-term HRQOL (Holbrook, Hoyt, Stein, & Sieber, 2001; Kiely, Brasel, Weidner, Guse, & Weigelt, 2006).

In sum, while there is considerable but inconsistent knowledge on psychological adjustment and HRQOL, little is known about the prevalence of PTSD in pediatric burn survivors and its association with HRQOL. Therefore, the objectives of our study were 2-fold. Firstly, we aimed at assessing PTSD and HRQOL in children and adolescents after burns. We hypothesized that ~15–30% of burn survivors would have PTSD, which would be comparable to the rates in accidentally

injured children who have sustained other types of physical trauma (Aaron, Zaglul, & Emery, 1999; Landolt, Vollrath, Timm, Gnehm, & Sennhauser, 2005). Also, we expected to find a good overall HRQOL with some impairments in social and emotional domains. Second, we aimed at examining the association of PTSD and HRQOL in burn survivors. Based on findings in adults, we hypothesized that children with PTSD would have a lower HRQOL than those without PTSD.

Method

Participants and Procedure

The study was approved by the local Institutional Review Board. Children and adolescents were included in the study if they met the following criteria: (a) hospitalization at the Pediatric Burn Center of the University Children's Hospital Zurich, Switzerland, between August 1998 and July 2004; (b) at least one skin grafting procedure due to deep burns; (c) no previous evidence of mental retardation; (d) current age between 7 and 16 years; and (e) fluency in German. Of 60 children who met these criteria, six could not be contacted. Thus, 54 children and parents were invited by letter to participate in the study, and written informed consent was obtained from the parents and those patients that were older than 12 years. Eleven families refused participation. The main reasons were that the family had no interest in the study (five cases) and that the child did not want to talk about the accident (three cases). The final sample, therefore, comprised 43 children (response rate 80%). There were no significant differences between participants and nonparticipants with regard to age at accident ($U=189.00$, $p=.308$), age at assessment ($U=201.50$, $p=.452$), sex ($\chi^2=1.13$, $p=.287$), total body surface area burned ($U=192.50$, $p=.343$), number of skin grafting procedures ($U=169.00$, $p=.248$), length of hospital stay ($U=183.00$, $p=.250$), and time lapse postburn ($U=232.00$, $p=.923$). Participating families were contacted by phone, and a face-to-face interview was scheduled for the child. Most interviews were conducted in the patients' homes. Demographic and medical variables were retrieved from the hospital records.

Measures

Posttraumatic Stress Disorder

PTSD symptoms were assessed using the German Version of the Clinician-Administered PTSD Scale for Children and Adolescents (CAPS-CA), which is considered to be today's gold standard in diagnosing child PTSD (Nader et al., 1996; Steil & Füscher, 2006). The CAPS-CA

consists of age-appropriate standardized items related to the DSM-IV PTSD symptoms, with 5-point rating scales assessing frequency and intensity of current symptoms. The instrument also assesses functional impairment in significant life areas that children may experience as a result of their symptoms. The CAPS-CA yields a dichotomous PTSD diagnosis according to DSM-IV criteria and continuous measures of PTSD symptom severity and frequency for the three symptom clusters and the overall symptomatology. Following the DSM-IV, the diagnosis of PTSD was made if participants reported at least one re-experiencing symptom, three avoidance/numbing symptoms, two arousal symptoms, and impairment in at least one life area. A symptom was rated as present if the item corresponding to the symptom was rated 1 or greater (Nader et al., 1996). In the present study, internal consistency of the CAPS-CA as measured by Cronbach's α was similar to the figures reported in the CAPS-CA manual (re-experiencing: $\alpha=.73$; avoidance/numbing: $\alpha=.80$; hyperarousal: $\alpha=.75$; total score: $\alpha=.89$).

Health-related Quality of Life

HRQOL was assessed using the TNO-AZL¹ Child Quality of Life Questionnaire (TACQOL) (Vogels et al., 2000). The TACQOL Child Form is a generic instrument designed for self-reported HRQOL assessment. The following seven domains are tapped by eight items each: physical functioning, basic motor functioning, autonomy, cognitive, social, positive emotional, and negative emotional functioning. Children were asked whether a specific symptom or problem had occurred during the 4 weeks prior to the interview. If affirmed, the child was requested to rate his emotional response to the problem. Answer choices were: *problem never occurred* (4), or, if the problem occurred, *I felt well* (3), *I did not feel so well* (2), *I felt rather bad* (1), *I felt bad* (0). The two scales on positive and negative emotions were scored on a scale from 0 to 2 *often* (2), *sometimes* (1), *never* (0). Maximum domain scores are 32 for the first five scales and 16 for the emotional scales. Higher scores represent better HRQOL. Internal and external validity of the TACQOL have been confirmed in previous studies (Vogels et al., 2000). Internal consistency coefficients in this study were acceptable and similar to those of the reference study (Table I). To obtain a reliable measure of overall HRQOL, we also computed a total score

by summing the items across all scales ($\alpha=.90$). The distribution of the total score was normal (Kolmogorov–Smirnov $Z=1.00$, $p=.268$). Reference data for this study were provided from a community sample of 1,048 Dutch children (Vogels et al., 2000).

Socioeconomic Status (SES)

SES was calculated by means of a sum score reflecting paternal occupation and maternal education (range 2–12 points). This sum score was used for correlational analyses. Three social classes were defined as follows: scores 2–5, lower class; scores 6–8, middle class; and scores 9–12, upper class. This measure has been shown to be a reliable and valid indicator of SES in our community (Landolt, Nuoffer, Steinmann, & Superti-Furga, 2002b).

Statistical Analyses

Data were analyzed using SPSS statistical software for Macintosh, release 11 (SPSS Inc., Chicago, IL, USA). Analyses were performed with two-sided tests with a $p < .05$ considered significant. Chi-squared analyses were used to compare nominal variables. Comparisons of TACQOL scales (raw scores) with published reference data were determined using one-sample t -tests. Moreover, we calculated effect sizes by Cohen's d to express the amount of difference between patients and the reference group for the TACQOL scales (Cohen, 1992). Three TACQOL scales (motor functions, autonomy, and positive emotions) and the CAPS-CA total score were not normally distributed according to the Kolmogorov–Smirnov Goodness of Fit test. Therefore, nonparametric Spearman–Brown rank correlations were calculated in order to examine associations between both CAPS-CA and TACQOL raw scores and various other variables. For correlational analyses, dichotomous variables such as sex or involvement of face were coded as dummy variables (0, 1).

Results

Sample Characteristics

Forty-three children (15 girls, 28 boys) with a mean age of 10.4 years ($SD=3.9$) at assessment participated in the study. The median age for burns for this sample was 5.2 years. Average time of follow-up was 4.4 years ($SD=2.0$), with a range of 1.3–7.1 years. SES of the families was as follows: 5 lower class (11.6%), 24 middle class (55.8%), and 7 upper class families (16.3%); in seven cases, SES was unknown. Mean burn size was 13.0% ($SD=15.0\%$) with a range of 1–70%.

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Two subjects had burns >60%. Nineteen children (44.2%) had face involvement. Burns were most frequently the results of scalds (51.2%) or fire (34.9%). Forty-six percent of the mothers were present at the place of accident. The average length of hospital stay was 33.5 days ($SD = 27.6$; range, 9–143). All patients needed skin grafting, which was an inclusion criterion in this study; 25.6% of the sample required more than one skin grafting procedure. Outpatient rehabilitation included compression therapy (100%), splints (34.9%), physical therapy (30.2%), occupational therapy (20.9%), and psychotherapy (4.7%). Eight children (18.6%) required plastic and reconstructive surgery.

Posttraumatic Stress Disorder

Of the 43 children in the study, 8 (18.6%) met full DSM-IV criteria for current PTSD. Analyses of symptom clusters of PTSD revealed that 55.8% met the criterion for re-experiencing, 25.6% for avoidance and psychic numbing, and 44.2% for arousal.

Health-related Quality of Life

Table I shows the mean TACQOL scores for the patients and the reference sample. Comparisons revealed that only

one of the HRQOL dimensions was below the norms published for healthy children (Vogels et al., 2000). Specifically, social functioning was significantly poorer, with an effect size in the medium range. Autonomy, motor, cognitive, and emotional functioning were reported to be normal. Interestingly, the burn survivors reported significantly fewer physical complaints compared to healthy children.

Correlates of Health-related Quality of Life and Posttraumatic Stress Disorder

Table II shows correlations between individual characteristics of the patient, medical variables, TACQOL scales, and the CAPS-CA score. Age at injury, sex, SES, length of follow-up, type and size of the burn injury, length of hospital stay, number of skin graftings, and face involvement were not related to either HRQOL or PTSD symptomatology. Higher age at assessment was significantly correlated with better autonomic functioning. Interestingly, maternal presence at the place of accident proved to be important. If mothers were present at the accident, children reported less PTSD symptoms, better physical and cognitive functioning, and better overall HRQOL at follow-up. However, the strongest correlations were found between severity of PTSD symptoms and several dimensions of HRQOL. Patients with more symptoms consistently reported significantly poorer quality of life with regard to physical, motor, cognitive, and emotional functioning. These associations were only slightly reduced when controlling for mother's presence at the accident (partial correlations, results available on request).

Spearman–Brown rank correlations between PTSD symptom clusters and dimensions of HRQOL showed a similar pattern: Severity of re-experiencing symptoms was significantly associated with physical functioning ($r = -.50$, $p = .001$), positive emotions ($r = -.40$, $p = .008$),

Table I. Health-Related Quality of Life (TACQOL Raw Scores) in Patients and Reference Group

TACQOL scales (%)	Patients		Reference group		Effect size	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>p</i>
Physical functions (.68)	26.42	4.58	25.00	5.10	.29	.049
Motor functions (.57)	29.84	2.86	29.81	3.23	.01	.951
Autonomy (.62)	31.33	1.81	31.20	1.97	.07	.651
Cognitive functions (.76)	27.21	5.18	28.49	3.90	.28	.113
Social functions (.72)	26.93	4.60	29.72	2.76	.74	.000
Positive emotions (.75)	13.30	2.50	13.60	2.50	.12	.440
Negative emotions (.73)	11.84	2.90	11.64	2.68	.07	.658

Table II. Spearman Correlation Coefficients between CAPS and TACQOL Scores and Sociodemographic and Medical Characteristics

	CAPS intensity	Age at injury	Age at assessment	Female sex	SES	Fire injury	Mother present at accident	Burn size	Face involved	Days in hospital	Number of skin graftings	Length of follow-up
CAPS intensity	1.00	-.08	-.06	-.10	-.02	.02	-.35*	.11	-.15	.13	.07	-.04
Physical functions	-.59***	.15	.01	.24	-.13	.00	.46**	-.20	.04	-.12	.07	-.19
Motor functions	-.32*	.18	.13	-.26	.23	-.12	.26	.04	.02	-.12	.04	-.09
Autonomy	-.09	.26	.31*	-.03	.20	.16	.01	.07	.08	.04	.14	-.07
Cognitive functions	-.57***	.04	-.02	-.04	.17	-.12	.36*	-.06	.15	-.22	.08	-.02
Social functions	-.21	.08	.23	-.12	.14	.01	.11	-.06	-.04	-.15	-.10	.20
Positive emotions	-.47***	.07	-.04	-.03	-.19	.06	.09	-.21	.02	-.22	-.30	-.05
Negative emotions	-.40**	.10	.11	.10	.22	.12	-.10	-.07	.08	-.04	-.10	.07
Total score	-.59***	.14	.08	.12	.09	.01	.35*	-.03	.09	-.15	-.05	-.04

Note. SES, socioeconomic status; * $p < .05$. ** $p < .01$. *** $p < .001$.

negative emotions ($r = -.37, p = .016$), and overall HRQOL ($r = -.49, p = .001$). Severity of avoidance/numbing symptoms was significantly related to physical functioning ($r = -.32, p = .037$), cognitive functions ($r = -.37, p = .014$), positive emotions ($r = -.44, p = .003$), and overall HRQOL ($r = -.40, p = .009$). Finally, severity of arousal symptoms showed significant correlations with physical ($r = -.67, p = .000$), motor ($r = -.48, p = .001$), cognitive ($r = -.61, p = .000$) and social ($r = -.31, p = .042$) functioning, with negative emotions ($r = -.50, p = .001$), and with overall HRQOL ($r = -.64, p = .000$).

The data were further analyzed by comparing HRQOL scores in patients with PTSD and without PTSD (Table III). Patients suffering from PTSD reported significantly impaired overall HRQOL as well as limited physical and negative emotional functioning. Effect sizes were found to be large. In addition, differences between the two groups regarding cognitive and positive emotional functioning were almost statistically significant, with moderate effect sizes.

Discussion

This cross-sectional study assessed posttraumatic stress symptomatology and HRQOL in children and adolescents after burn injuries. We found that 18.6% met DSM-IV criteria for current PTSD at an average of 4.4 years after the accident. Although previous studies have reported posttraumatic stress symptoms in this group of children, the present study is the first to report valid DSM-IV rates of PTSD in school-age pediatric burn survivors that were assessed with a structured clinical interview. Our results are consistent with our hypothesis that rates of PTSD in children who experienced burns are very similar to those in accidentally injured children who have sustained other types of physical trauma

(Aaron et al., 1999; Landolt et al., 2005; Stallard, Velleman, & Baldwin, 1998). The findings also add to early results by Stoddard et al. (1989a), who found 6.7% of their sample with a mean burn size of 38% to meet DSM-III criteria for PTSD. Reasons for the higher PTSD rates in the current study include differences in diagnostic criteria between DSM-III and DSM-IV and a longer follow-up period of 8.9 years in the study by Stoddard et al., which may have reduced the prevalence of PTSD. Notably, our rates of PTSD are lower than the 30% rate of acute stress symptomatology in a recent study by Stoddard et al. (2006b) among preschool children with almost the same mean burn size as in our study. However, previous longitudinal studies in injured children have shown that traumatic stress symptoms are more prevalent in the immediate aftermath of a trauma than at follow-up (Meiser-Stedman, Yule, Smith, Glucksman, & Dalgleish, 2005). Also, PTSD symptoms are known to regularly decrease over time (Saxe et al., 2001). Considering these two points, the PTSD rates in the current study are perfectly in line with the previously reported higher rates of acute stress symptoms in younger children.

Besides PTSD, this study also assessed HRQOL as another important outcome variable. Consistent with our hypothesis and previous findings, our results show that pediatric burn survivors, even those with severe burns, have an almost normal HRQOL. Diminished social functioning was the only abnormality identified. This is interesting, because the presence of burn scars has often been reported to lead to social problems in the individual child due to negative reactions by others (Blakeney et al., 1993). Our findings clearly confirm this observation and suggest an increased social vulnerability of the burned child.

We also aimed at examining various correlates of PTSD and quality of life. Interestingly, we found very strong associations between the intensity of PTSD symptoms and HRQOL. Correlations with HRQOL were very similar for overall PTSD symptoms as well as for all three PTSD symptom clusters. A detailed analysis of children with PTSD revealed major impairments in physical and emotional dimensions of HRQOL. These results have not previously been reported in injured children but are known from studies in adults (Holbrook et al., 2001; Kiely et al., 2006). While correlations between PTSD and emotional dimensions of HRQOL can be expected given that they are assessing some similar symptoms, associations between PTSD and physical dimensions of HRQOL are of particular interest. Our results suggest that the suffering associated with PTSD may extend beyond

Table III. Health-related quality of life in patients with PTSD and without PTSD

TACQOL scales	Patients with PTSD ($n = 8$)		Patients without PTSD ($n = 35$)		Effect size	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	p^a
Physical functions	21.13	5.96	27.63	3.24	1.36	.003
Motor functions	29.50	2.45	29.91	2.97	.15	.343
Autonomy	31.25	1.75	31.34	1.85	.05	.792
Cognitive functions	24.63	5.34	27.80	5.04	.61	.073
Social functions	25.00	7.50	27.37	3.67	.40	.718
Positive emotions	11.63	3.58	13.69	2.07	.70	.073
Negative emotions	9.88	2.70	12.29	2.79	.88	.033
Total score	153.00	15.68	170.03	20.47	.93	.017

Note. ^aMann Whitney U-test.

the symptoms of the disorder to multiple domains of HRQOL, including physical functions. Considering the pattern of correlations between HRQOL and the PTSD symptom clusters one may speculate that symptoms of hyperarousal may be of particular importance because they show the strongest associations with both physical and emotional dimensions of HRQOL. Yet, symptoms of re-experiencing and symptoms of avoidance/numbing were also related both to physical and emotional dimensions of HRQOL. Importantly, because such associations between PTSD symptom clusters and quality of life have never been studied in children they need to be replicated in future studies that also address the issue of causality. Based on prospective studies in adults (Kiely et al., 2006), we consider reduced HRQOL to be caused by posttraumatic stress symptoms, but the relationship between PTSD and HRQOL may not be only unidirectional. As noted by Schnurr, Hayes, Lunney, McFall, and Uddo (2006), symptoms of PTSD and HRQOL may interact mutually over time.

This study also examined the importance of other variables in predicting HRQOL and PTSD. Although our findings are correlational, one may speculate that maternal presence at the place of accident could have a protective influence with regard to HRQOL and the development of PTSD. This finding has not been reported previously. The immediate presence of the mother may have a calming and reassuring influence on the child and thus may help him or her to cope with the trauma. Notably, in this study PTSD and HRQOL were not associated with medical characteristics such as size of burn injury, length of hospitalization, number of skin graftings, or face involvement. This is in line with several earlier studies in children who experienced burns (Landolt et al., 2002a; Noronha & Faust, 2007; Sheridan et al., 2000).

The strengths of this study comprise its use of validated and highly standardized self-report measures of PTSD and HRQOL in a sample of pediatric burn survivors with a response rate of almost 80%. Nonetheless, some limitations merit note. First, this study was cross-sectional and examined a rather small sample that may not be representative because families from the upper- and middle-class were overrepresented. Moreover, three children refused participation because they did not want to talk about the accident. Possibly, they did so because of avoidance characteristics of PTSD. Thus, our prevalence estimates of PTSD may be too conservative. Second, the TACQOL is a generic measure of HRQOL and may lack sensitivity for specific problems of burn survivors. However, the TACQOL has been shown to be

a valid and reliable instrument in children with different chronic conditions allowing comparison with healthy references. Appropriateness of Dutch reference values for our sample of Swiss children is supported by similar social structures in the two countries and a recent study that found HRQOL of chronically ill children to be very similar within central European countries (Schmidt et al., 2006). Third, although we assessed several individual and medical determinants of PTSD and HRQOL, other possibly important variables such as pretraumatic psychopathology and health status, personality, coping, or parental adjustment were not considered. Finally, there may be some concerns regarding our correlational findings, since the chance of false-positive results increases with more comparisons performed on the same data set. However, this study had an exploratory character and the sample size did not allow multivariate analyses.

In spite of these limitations, our data provide tentative evidence for a considerably high prevalence of PTSD in pediatric burn survivors and for a negative association between PTSD and HRQOL. These findings suggest some issues for future research and clinical management. First, our findings need to be replicated in other and larger samples of traumatized children. Second, our results bring up the question whether early identification and appropriate treatment of pediatric burn survivors with PTSD may be crucial not only to minimize long-term psychological morbidity, but also to possibly enhance HRQOL outcomes. Such interventions should be offered to children irrespective of the severity of the burn injury. As highlighted by Holbrook et al. (2005) the return of injured children to preinjury quality of life may depend not only on optimal medical care, but also on awareness and timely psychological interventions regarding posttraumatic stress symptoms.

Conflict of interest: None declared.

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